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L17: Entry 22 of 24 File: USPT Feb 26, 1991

DOCUMENT-IDENTIFIER: US 4995268 A
TITLE: Method and apparatus for determining a rate of flow of blood for an extracorporeal blood therapy instrument

Abstract Text (1):
Method and apparatus for determining the flow rate of blood passing between a patient and an extracorporeal therapy instrument. The flow measurement apparatus includes a delivery unit for producing a saline bolus interface at a first position of a measurement channel having a predetermined volume between the first and second position. A sensor unit included in the apparatus detects the saline bolus interface as it passes the second position in the channel. An output signal from the sensor unit along with an indication of the production of the saline bolus interface is utilized by a control unit to determine the blood flow rate. The control unit of the apparatus utilizes instantaneous and average blood flow algorithms to calculate instantaneous and average blood flow rates based on the time interval associated with the production of the saline bolus interface and its progression to a predetermined position in the measurement channel. Successive interfaces are also produced in the blood flow to derive an average blood flow rate.

Brief Summary Text (14):
The foregoing and other problems are solved, and a technical advance is achieved by illustrative method and apparatus for determining the rate of flow of blood in a flow measurement channel typically leading to an extracorporeal blood therapy instrument. This method and apparatus advantageously ensures that blood returning to a patient is safe and that the blood flow is sufficient. The illustrative apparatus includes a delivery unit for producing an interface between the incoming blood and another fluid, such as saline, at a first position in the channel. The apparatus also includes a sensor unit for producing an output signal indicative of when the interface has reached a second position in the channel. The measurement channel has a predetermined volume between the first and second positions. Also included is a control unit utilizing an indication of the channel volume and a predetermined algorithm for calculating the blood flow rate through the channel in response to an indication of the production of the interface and the sensor output signal.

Brief Summary Text (18):
The control unit of the apparatus includes a timer for determining a time period initiated by an indication of the production of the interface by the delivery unit and terminated by the sensor output signal indicating when the interface is at the second position in the channel. The control unit also includes a processor that utilizes a predetermined algorithm for calculating the blood flow rate as a function of the sensed time period and the volume of the channel. The control unit is further responsive to the second through fourth output signals for determining a quantity for the bubbles, particles, and pulsating blood flow, respectively.

Detailed Description Text (34):
The flowmeter apparatus is also utilized to rinse blood from the blood therapy instrument. At a designated time, clamp unit 118 closes the arterial line and opens the other fluid line. Priming fluid is then continually drawn into the other arterial tubing and passes through the membrane unit of the blood therapy instrument. Rinsing is complete when the fluid within the venous line becomes low in hematocrit. This is detected by the use of optical device pair 129 and 131. When dialyzers are rinsed manually, the operator observes the venous line and stops rinsing when the line

appears "light pink." The photometer of the sensor unit yields a low voltage signal when the hematocrit falls below 3%. Based on this output signal, the apparatus continually rinses the dialyzer it until is nearly completely devoid of blood cells, then automatically stops the rinsing. If the roller pump is then stopped, the clamp unit moves to a neutral position opening both arterial and fluid lines. Hydrostatic pressure within the prime fluid line will then allow fluid to rinse the arterial line. The volume of the prime fluid rinsing the arterial line is either visually monitored or preset through the key pad. When rinsed sufficiently, clamp unit 118 is directed to occlude fluid line 107.

CLAIMS:

12. The apparatus of claim 1 wherein said control means includes timer means for determining a time period initiated by said indication of when said trailing interface is produced and terminated by said output signal and further including processor means utilizing said predetermined algorithm and said indication of said volume and responsive to said time period for calculating said blood flow rate.

16. The apparatus of claim 14 wherein said control means includes memory means for storing a plurality of said time periods and wherein said processor means utilizes a second predetermined algorithm and said indication of said volume and is responsive to said time periods for calculating an average blood flow rate.

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L5: Entry 5 of 9 File: USPT Nov 26, 2002

US-PAT-NO: 6485961
DOCUMENT-IDENTIFIER: US 6485961 B1

TITLE: Electrodes having a continuous, crystalline metal nitride coating and method of use

DATE-ISSUED: November 26, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Meserol; Peter	Montville	NJ		

US-CL-CURRENT: 435/285.2; 204/290.12, 204/290.13, 435/173.6

CLAIMS:

What is claimed is:

1. Apparatus for electrical stimulation of particles in a saline solution, comprising: walls defining a particle electrical stimulation chamber; and a pair of electrodes disposed along opposing walls of said chamber, said electrodes comprising means for placing said electrodes in electrical communication with a source of electrical energy, whereby particles in said chamber are subjected to an electrical field; said electrodes each further comprising an external surface with at least a portion thereof corresponding to the emission of the electrical field having a continuous crystalline metal nitride coating.

2. The apparatus of claim 1, wherein the electrical energy is high voltage, pulsed electrical energy.

3. The apparatus of claim 1, wherein at least a portion the surface of both electrodes corresponding to the emission of the electrical field has a continuous crystalline metal nitride coating.

4. The apparatus of claim 1, wherein the continuous crystalline metal nitride coating is selected from the group consisting of titanium nitride, titanium aluminum nitride, chromium nitride, and zirconium nitride.

5. A flow electroporation device comprising: a housing having internal walls defining a continuous internal chamber through said housing, said internal chamber being configured to receive a continuous flow volume of blood therethrough; a first electrode having a first specified length and disposed within said internal chamber; a second electrode having a second specified length and disposed within said internal chamber in spaced-apart relation to said first electrode; said first and second electrodes being arranged within said internal chamber to permit said continuous flow volume of blood flowing through said internal chamber to pass between said electrodes; said first and second electrodes being operative when connected to a pulse generator to emit pulses of electronic energy from said first electrode through the blood to the second electrode as said continuous flow volume of blood flows through said internal chamber; and at least a portion of one of said first and second electrodes having a continuous crystalline metal nitride coating; the frequency of pulses of electronic energy emitted through said electrodes, said first and second

specified lengths of said electrodes, and the rate of flow of said continuous flow volume of blood flowing through said internal chamber being such that blood cells in said volume of blood may be electroporated while flowing through said internal chamber.

6. The apparatus of claim 5, wherein the electrical energy is high voltage, pulsed electrical energy.

7. The apparatus of claim 5, wherein at least a portion the surface of both electrodes corresponding to the emission of the electrical field has a continuous crystalline metal nitride coating.

8. The apparatus of claim 5, wherein the continuous crystalline metal nitride coating is selected from the group consisting of titanium nitride, titanium aluminum nitride, chromium nitride, and zirconium nitride.

9. A method of generating an electronic signal in a saline solution comprising: a. providing a device comprising walls defining a chamber for pair of electrodes disposed along opposing sides of said chamber, said electrodes comprising means for placing said electrodes in electrical communication with a source of electrical energy, whereby the saline solution is subjected to an electrical field; said electrodes each further comprising an external surface with at least a portion thereof corresponding to emission of the electrical field having a continuous crystalline metal nitride coating; b. adding a saline solution to the chamber; and, c. generating an electronic signal in the saline solution.

10. The method of claim 9, wherein the saline solution contains a biological particle.

11. The method of claim 10, wherein the biological particle is a cell.

12. The method of claim 9, wherein the electrical signal is high voltage, pulsed electrical energy.

13. The method of claim 9, wherein at least a portion the surface of both electrodes corresponding to the emission of the electrical field has a continuous crystalline metal nitride coating.

14. The method of claim 9, wherein the continuous metal nitride coating is selected from the group consisting of titanium nitride, titanium aluminum nitride, chromium nitride, and zirconium nitride.

15. An improved electrode comprising an electrode having continuous crystalline metal nitride coating on at least one surface thereof, wherein the coating inhibits the migration of metal ions from the electrode.

16. The electrode of claim 15, wherein at least a surface portion of the electrode corresponding to the emission of an electrical field has a continuous crystalline metal nitride coating.

17. The electrode of claim 15, wherein the continuous crystalline metal nitride coating is selected from the group consisting of titanium nitride, titanium aluminum nitride, chromium nitride, and zirconium nitride.

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L9: Entry 17 of 17 File: USPT Feb 24, 1998

DOCUMENT-IDENTIFIER: US 5720921 A
TITLE: Flow electroporation chamber and method

Detailed Description Text (124):
An optional feature of the electroporation apparatus 400 hereinabove described is that the series of Peltier thermo-electric cooling elements 374 can be individually controllable, such that cooling elements 374 at one location along the flow cell 364 can provide a greater or lesser degree of cooling than other cooling elements 374 at other locations along the flow cell 364. Since the biological particles are being heated as they move along the flow cell 364, more cooling may be necessary closer to the discharge end of the flow cell 364 than is necessary adjacent the input end. Providing individual control over the various thermo-electric cooling elements 374 permits accommodation of these variations. The various thermo-electric cooling elements 374 can be controlled either by placing thermal sensors at various locations along the flow cell, inputting the sensed temperatures into the circuitboard computation means 412, and controlling the various thermo-electric cooling elements in response to the sensed temperatures. Or, the various thermo-electric cooling elements 374 can be controlled according to a predetermined "average" temperature variance of the biological particles along the flow cell. Other methods for controlling various thermo-electric cooling elements 374 will occur to those skilled in the art.

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L9: Entry 17 of 17 File: USPT Feb 24, 1998

US-PAT-NO: 5720921
DOCUMENT-IDENTIFIER: US 5720921 A

TITLE: Flow electroporation chamber and method

DATE-ISSUED: February 24, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Meserol; Peter M.	Montville	NJ		

US-CL-CURRENT: 422/44; 435/173.6, 435/285.2, 435/461, 435/470, 604/6.02

CLAIMS:

What is claimed is:

1. Apparatus for poration of biological particles, comprising:

walls defining a fluid flow path;

electrodes disposed along opposing sides of said fluid flow path, said electrodes including means for placing said electrodes in electrical communication with a source of pulsed electrical energy, whereby biological particles moving along said fluid flow path are subjected to a pulsed electrical field;

said apparatus being characterized by at least one of said walls defining said fluid flow path being elastically deformable and at least another one of said walls defining said fluid flow path being substantially rigid;

whereby transient pressure increases within said fluid flow path are at least partially absorbed by said elastic material of said wall.

2. The electroporation chamber of claim 1, wherein said at least one of said walls defining said fluid flow path being comprised of a deformable, elastic material comprises two of said walls being comprised of a deformable, elastic material.

3. The electroporation chamber of claim 1, wherein said electrodes comprise continuous band electrodes.

4. Apparatus for poration of biological particles, said apparatus being removably mounted to a support member, said apparatus comprising:

walls defining a fluid flow path;

electrodes disposed along opposing sides of said fluid flow path, said electrodes including means for placing said electrodes in electrical communication with a source of pulsed electrical energy, whereby biological particles moving along said fluid flow path are subjected to a pulsed electrical field; and

means connected to said electrodes when said apparatus is mounted to a support

member for destroying said electrodes prior to said apparatus being removed from said support member;

whereby said apparatus cannot be re-used.

5. The electroporation chamber of claim 4,

wherein said means for placing said electrodes in electrical communication with a source of energy comprises a spindle, said electrodes being wrapped around at least a portion of the periphery of an associated spindle; and

wherein said means for destroying said electrodes comprises means for rotating said spindles so as to stretch said electrodes beyond their tensile limits, thereby rupturing said electrodes and rendering them electrically inoperative.

6. Apparatus for poration of biological particles, comprising:

walls defining a fluid flow path;

electrodes disposed along opposing sides of said fluid flow path, said electrodes including means for placing said electrodes in electrical communication with a source of pulsed electrical energy, whereby biological particles moving along said fluid flow path are subjected to a pulsed electrical field;

pump means for moving said biological particles along said fluid flow path; and

control means responsive to the rate at which said pump moves said biological particles along said fluid flow path for controlling the interval between pulses of said electrical energy,

whereby said biological particles moving along said fluid flow path are exposed to a predetermined number of pulses during their exposure between said electrodes.